

1. (20 points) A small company called Maple, Inc. is designing a fancy gift box with a square base. The box must have a volume of 3000 cm^3 . The gift box has a lid which is to be made of a material that costs \$1 per square centimeter. The material for the sides of the box costs \$0.75 per cm^2 , and the material for the bottom is \$0.80 per cm^2 .
- (a) (10 pts.) What are the dimensions of the cheapest gift box the company can make?

It turns out that Maple, Inc. also produces a cube-shaped wooden box to store jewelry. The cost of producing q of these boxes is given by

$$C(q) = 8600 + 0.0001(q - 80)^3(q + 90).$$

- (b) (3 pts.) What is the marginal cost when 80 boxes are made? Show your work.

(This problem continues on the next page.)

(This is a continuation of Problem 1).

- (c) (3 pts.) The marginal cost of producing 95 of the cube-shaped jewelry boxes is about \$13 per box. Explain what this means in practical terms. (Your explanation should be understandable to someone who does not know calculus or economics language).

- (d) (4 pts.) Let R and P denote, respectively, the revenue and the profit of Maple, Inc. from selling q of the cube-shaped jewelry boxes. Fill in the blank and circle the right choice in the paragraph below, as indicated.

If the profit P is maximized when 95 jewelry boxes are sold, then

$R'(95) =$ _____ dollars per box (*fill in the blank*), and $P''(95)$ must be

POSITIVE / NEGATIVE / ZERO (*circle the appropriate choice*).